

A SYNOPSIS OF AFRICAN SPECIES OF DELPHINIUM AND CONSOLIDIA

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LIKE SEVERAL OTHER HERBACEOUS GENERA of the Ranunculaceae, notably *Isopyrum*, *Coptis*, *Actaea*, *Aquilegia*, and *Aconitum* as examples, *Delphinium* is of the North Temperate Zone, but it differs remarkably in its far southern range on to the higher mountains, even, of central Africa. My interest in making some attempt to understand the species of this widespread group began when preparing a treatment of cultivated forms for *Hortus III*, since I had considerable misgiving as to the correct names and limits of some of the species involved.

With the American species fairly well understood (cf. EWAN, J. A., A synopsis of the North American species of *Delphinium*. Univ. Colo. Stud. D. 2(2): 55-244. 1945; and LEWIS, H. & C. EPLING, A taxonomic study of Californian delphiniums. *Brittonia* 8: 1-22. 1954), and with European species well summarized by A. O. CHATER & B. PAWLOWSKI (cf. *Flora Europaea* 1: 213-217. 1964), one turns naturally to Asiatic and African species as most needing study. The latter continent has the fewer and it seems well to treat these first, hence the present paper. The much more complex and larger Asiatic representation will be treated in subsequent articles.

In both the *Flora Europaea* cited above and in P. H. DAVIS, *Flora of Turkey* 1: 108-134. 1965, two genera are recognized: *Delphinium*, *sensu stricto*, and *Consolida*. The former is characterized by four separate petals (nectaries, honey-leaves), the two upper being spurred and secreting nectar, the spurs inserted into the sepal spur, the two lower petals not nectariferous, merely with a narrow claw and dilated lamina. Stamens in 8 spiralled series. Carpels 3, rarely 4 or 5. An almost entirely perennial group which includes the plants cultivated as "delphiniums."

Consolida, on the other hand, has a single "petal" (nectary or honey-leaf), said to be formed by the union of the two superior petals of *Delphinium*, and one spur. The two lower petals are said to be lacking. Stamens in 5 series. Carpel solitary. Plants annual. Here fall the species known in gardens as "larkspurs."

I am following the above usage in my series of proposed papers. In his monograph of *Delphinium*, *sensu lato*, Huth (Bot. Jahrb. 20: 322-499. 1895) has rather an elaborate scheme of sections and tribes, which in many cases do not seem to me to represent natural groups and which separate widely quite closely related species. I am not prepared to enter into any such scheme of subgeneric categories and can do no more than offer artificial keys for identification of species. Under each species treated synonymy

is given at least for the geographic area involved, with a description and general distribution, and with mention of some representative illustrations in the literature. Where material has been available, there is shown a line drawing of the petals or "petal." Some of the principal exsiccatae are listed with the name of the collector and his collection number, by country, but without stating the exact locality or herbaria in which deposited.

To the curators of the herbaria at the following American institutions, from which material was borrowed, I express herewith my very great appreciation:

Arnold Arboretum (A)
Bailey Hortorium (BH)
California Academy of Sciences (CAS)
Field Museum, Chicago (F)
Gray Herbarium (GH)
Missouri Botanical Garden (MO)
New York Botanical Garden (NY)
Academy of Natural Sciences, Philadelphia (PH)
United States National Arboretum (NA)
United States National Herbarium (US)
University of California, Berkeley (UC)
University of Michigan (MICH)

I was given, also, the privilege of working for some months at the British Museum of Natural History (BM), at the Royal Botanic Gardens at Kew (K), and the Muséum National d'Histoire Naturelle at Paris (P). In addition, I have had loans from the Royal Botanic Garden at Edinburgh (E), the Komarov Botanical Institute at Leningrad (LE), the Conservatoire et Jardin botaniques at Geneva (G), the Naturhistorisches Museum at Wien (W), and the Botanisches Institut und Botanischer Garten der Universität Wien (WU). I am greatly indebted to all the officers in charge of these collections.

It is a pleasure also to acknowledge my obligation to the National Science Foundation for the financial aid received under Grant GB-2716.

The present series of papers cannot be monographic in nature, but merely synoptic, with the hope of presenting keys and means of identification as a useful step in our present knowledge. True monographic work must come later, when there is access to the regions inhabited by many of the species and observations can be made of them as living organisms.

1. *Delphinium* L.

Delphinium, as a genus, L. Sp. Pl. 1: 530. 1753; Gen. Pl. ed. 5. 236. 1754.

Huth, Bot. Jahrb. 20: 322-499. pls. 6, 7. 1895. As a subgenus, *Eudelphinium* (Huth) Dalla Torre & Harms, Genera Siphonogamarum 165. 1901.

Mostly perennial, more rarely biennial or annual, herbs. Leaves alternate, palmately divided. Flowers zygomorphic, mostly in racemes or

panicles. Sepals 5, petaloid, the posterior one normally spurred. Petals four, in two unlike pairs, the upper pair, sometimes called nectaries or honey-leaves, produced into nectariferous spurs inserted into the sepal spur; the lower pair with a basal claw and expanded lamina. Stamens in eight spiralled series. Carpels 3 (-5), free, becoming follicles.

TYPE SPECIES, *D. peregrinum* L.

KEY TO THE AFRICAN SPECIES OF *DELPHINIUM*, *sensu stricto*

- a. Plants perennial.
 - b. Petals glabrous, the upper with lateral wings on the limb. Morocco to Tunis. 2. *D. balansae*.
 - b. Petals bearded and/or ciliate.
 - c. Spur 5-8 mm. long, ca. 4 mm. wide at base; upper petals short-pubescent toward the tips. Ethiopia southward. 3. *D. dasycaulon*.
 - c. Spur longer; upper petals glabrous.
 - d. The spur 12-15 mm. long; flowers bluish.
 - e. Radical leaves 10-15 cm. in diameter; racemes many-flowered; carpels 3; seeds blackish, 2-3 mm. long. E. Algeria and Tunisia. 6. *D. sylvaticum*.
 - e. Radical leaves 3-7 cm. in diameter; racemes 4-10-flowered; carpels 5 (3, 4, or 6); seeds dark, 1.5-2 mm. long. Morocco to Tunis.
 - f. Carpels nearly always 5, divergent; sepals 12-16 mm. long. 7. *D. pentagynum*.
 - f. Carpels 3, erect; sepals 10-13 mm. long.
 - g. Sepals bright blue, distinctly shorter than the spur. 9. *D. nevadense*.
 - g. Sepals bluish lilac, about as long as or shorter than the spur. 8. *D. emarginatum*.
 - d. The spur 20-45 mm. long; flowers white to purplish, pinkish or bluish. Tropical Africa at higher elevations.
 - h. Spur slender, 3-4 mm. wide at the base, 30-45 mm. long; upper petals glabrous; sepals mostly 25-40 mm. long. 4. *D. leroyi*.
 - h. Spur thick, 5-7 mm. wide at base, 20-26 mm. long; upper petals pubescent; sepals mostly 10-15 mm. long. 5. *D. macrocentron*.
 - a. Plants annual or biennial.
 - i. Middle caudine leaf blades 10-20 cm. long, 5-9-parted; blade of lower petal asymmetrically oblanceolate, gradually attenuate into the claw.
 - 1. *D. staphisagria*.
 - i. Middle caudine leaf blades mostly 2-3 cm. long; blade of the lower petals asymmetrically oblong to rounded.
 - j. Carpels 3; flowers few to several, the receptacle not inflated.
 - k. Limb of lower petals ovate to elliptic, cuneate at base, gradually narrowed into claw. Eastern Mediterranean.
 - l. The limb of lower petals more or less elliptic, often about as long as the claw; plant subglabrous to slightly pubescent, 2-7 dm. tall; racemes several- to many-flowered. 11. *D. peregrinum*.

1. The limb of lower petals almost round, shorter than the claw; plant grayish pubescent, 0.3–1.5 dm. tall; racemes mostly 2–3-flowered. 12. *D. nanum*.
- k. Limb of lower petals abruptly contracted into the claw, not cuneate at the base. Western Mediterranean.
- m. The limb of the lower petals not or little shorter than the claw, usually distinctly exserted, not cordate at the base. 13. *D. obcordatum*.
- m. The limb of the lower petals $\frac{1}{2}$ – $\frac{3}{4}$ as long as the claw, cordate or subcordate at the base.
- n. Limb of lower petals oblong, $1\frac{1}{2}$ –2 times as long as wide, exserted. 14. *D. gracile*.
- n. Limb of lower petals suborbicular, included.
 - o. The limb of the lower petals strongly cordate at the base. Uncommon. 15. *D. verdunense*.
 - o. The limb of the lower petals weakly cordate at the base. Common. 16. *D. halteratum*.
- j. Carpels 5; flowers many, in a dense raceme to 4 dm. long. Morocco. 10. *D. cossonianum*.

1. ***Delphinium staphisagria* L. Sp. Pl. 1: 531. 1753.**

FIG. 1.

Staphisagria macrosperma Spach, Hist. Nat. Vég. Phan. 7: 348. 1839. Sibth. & Sm. Fl. Graeca 6: pl. 508. 1826.

Annual or biennial, usually 1-stemmed, simple or few-branched above, 3–12 dm. tall, leafy, soft hairy with fine, often long, spreading hairs and densely covered also with short retrorse hairs; leaves large, the blade rounded or broader, to 2 dm. in diameter, more or less finely strigose and with longer hairs, 5–9-parted, the segments entire or 2–3-lobed, these ultimate divisions broadly lanceolate, sharply acute, 3-veined, often entire or with few large teeth; petioles mostly longer than the blades, dilated at base, with both kinds of pubescence; racemes terminal, dense or lax, usually many flowered on main stem, few flowered on branches; lower bracts foliose, 3-parted or entire, sessile or petioled, from half as long to as long as pedicel; pedicels 0.5–5 cm. long, densely hairy and strigose, bibracteolate near the base; flowers mostly deep blue, 2–3 cm. in diameter; calyx fine-hairy without, the upper sepal oblong-ovate, 1–2 cm. long, the saccate spur 2–3 mm. long and wide; lateral sepals ovate, ca. 1.5 cm. long, rounded at apex, lower sepals similar but slightly shorter; upper petals white or bluish, pubescent, obtuse, simple or more or less bilobed at summit, 10–12 mm. long, short-spurred at base; lower petals glabrous or pubescent, more or less spatulate or obovate-cuneiform, somewhat asymmetrical, ca. 14–16 mm. long; stamens 8–10 mm. long, filaments ciliate above, glabrous and dilated below; carpels 3, long-pubescent, inflated and 12–20 mm. long at maturity; seeds few, 5–6 mm. long, blackish, obpyramidal, 3-angled, reticulate-foveolate.

Type not given; described as from Istria, Dalmatia, Apulia, and Calabria.

DISTRIBUTION. Mostly in woods and rocky places about the base of mountains; Canary Islands; Mediterranean region in Morocco, Algeria, southern Europe; Syria, Palestine, Turkey.

ILLUSTRATIONS. SIBTHORP & SMITH, Fl. Graeca 6: pl. 508. 1826; COSTE, Fl. France 1: 51. 1901; MAIRE, Fl. de l'Afrique du Nord 11: 84. 1964.

REPRESENTATIVE SPECIMENS. Canary Islands: Bornmüller 2013; Bourgeau 1231, 428. Morocco: Font Quer 107. Algeria: Alleizetti, 1953; Le Cesve, 1938; Cossen, 1854; G. Munby, 1844, 1850; Durando, 1855.

Delphinium staphisagria is a species quite unrelated to any others. To begin with, there are few annual species in *Delphinium* and they differ widely from this one in appearance and technical characters. The leaves and terminal spikes of flowers give the general appearance of a lupine until they are examined more closely.

2. *Delphinium balansae* Boiss. & Reut. in Boiss., Diagn., II. 5: 12. 1856. FIG. 2.

D. balansae formae *pallidum* and *caeruleum* Maire, Fl. de l'Afrique du Nord 11: 83. 1964.

Perennial from a somewhat woody crown above a taproot system, but sometimes flowering in its first year; stems slender, several suberect, more or less strigulose to subglabrous, 2-7 dm. tall, simple or with some branching almost throughout, slightly angular; basal and lower leaves long-petioled, tripartite, the cuneate parts trifid, the ultimate segments linear to oblong, subglabrous, sometimes more or less ciliate, callous-tipped, the whole blade 2-5 cm. wide, somewhat shorter; caudine leaves simpler, shorter-petioled, quite persistent, the uppermost linear, entire; racemes rather lax, 2-10-flowered; bracts linear, 5-12 mm. long; pedicels strigose, 5-25 mm. long, the bracteoles ca. 4.5 mm. long; flowers whitish with a bluish or greenish tinge, or blue; the upper sepal ca. 6-7 mm. long, somewhat strigulose and with an almost straight or slightly curved horizontal strigulose spur 3-4 mm. wide at the base, 12-16 mm. long; lateral sepals oblong, ca. 8 mm. long, strigose along the midrib, the lower pair strigose over the entire outer surface and more pointed; upper petals glabrous, 2-lobed, slightly shorter than the sepals and ca. 7 mm. wide; lower petals ca. 8 mm. long, oblong-oval, sometimes with a cordate base, abruptly narrowed to a narrow claw; stamens somewhat shorter than the sepals, the filaments dilated below, glabrous; carpels 3, pubescent, 8-9 mm. long in fruit; seeds dark, subglobose, ca. 2 mm. in diameter, with rings of scales.

TYPE: near Lambese, North Africa, *Balansa* 1853, as *D. junceum* (photo. BH).

DISTRIBUTION. Calcareous areas below 2500 m., Morocco to Tunis.

ILLUSTRATIONS. MAIRE, Fl. de l'Afrique du Nord 11: 82. 1964.

REPRESENTATIVE SPECIMENS. Morocco: O. Polunin 2138; Gattefossé 220b;

Font Quer 209; *Jahandiez* 742, 858; *E. K. Balls* 3133. *Algeria*: *Kralik*, June 2, 1858; *Cosson*, July 26, 1854, July 22, 1861; *Faure*, Aug. 3, 1933; *Chevallier* 255.

Material at British Museum has the pale-flowered plants more erect and with stouter stems, the blue-flowered plants more spreading and diffuse, and with slender stems.

3. *Delphinium dasycaulon* Fresen, *Mus. Senckenb.* 2: 272. 1837.

FIG. 3.

? *D. dasycaulon* var. *minor* Cufodontis, *Bot. Inst. Univ. Wien* 39: 103–126. 1958.

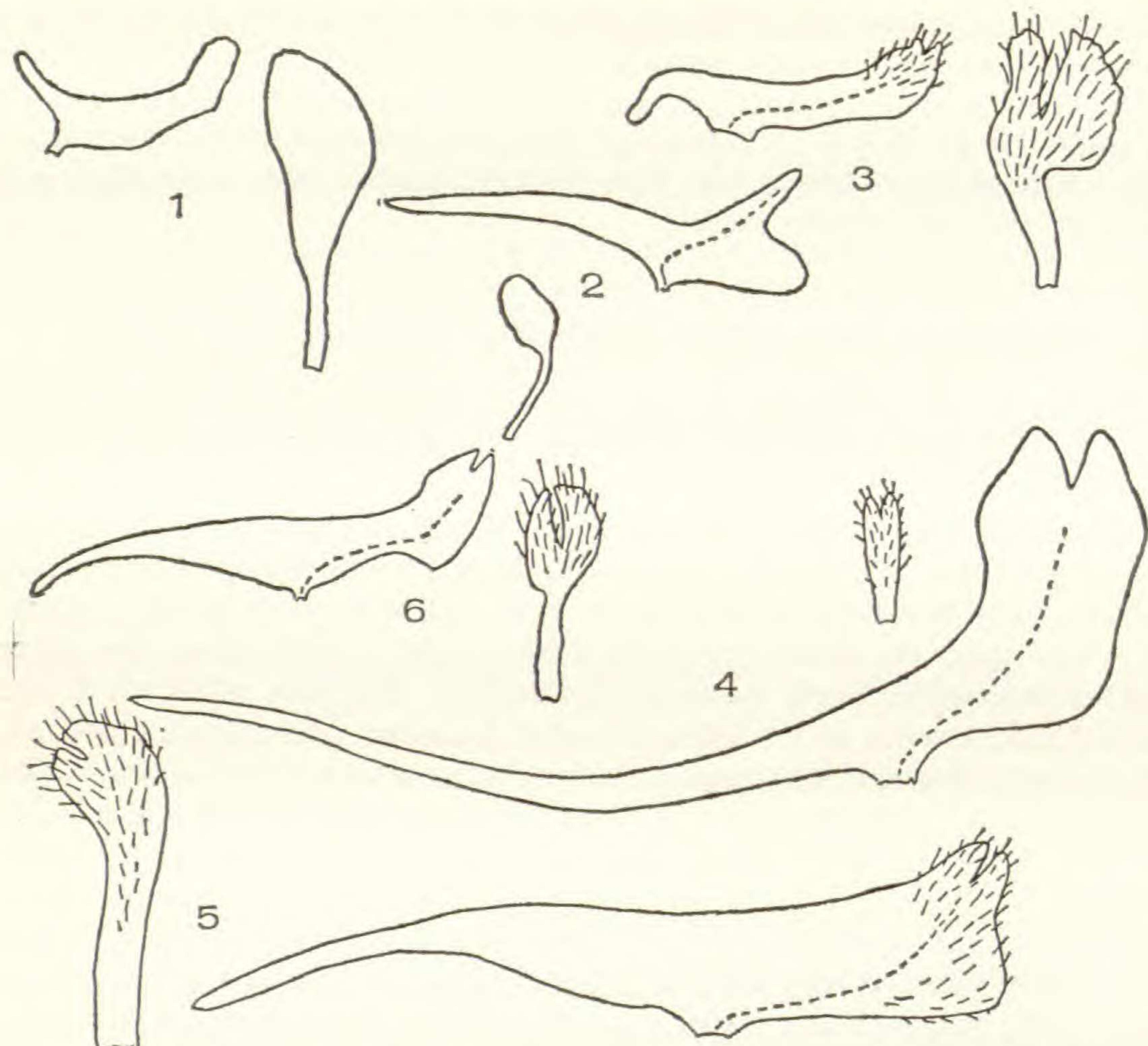
Perennial from a woody elongate root, the stem largely solitary, weakly erect, 5–15 dm. tall, slender, scattered villous, more or less openly branched above; basal and lower caudine leaves 1–1.5 dm. wide, with slender petioles 1–4 dm. long, the blades 3–5-parted into broad incised lobes, the upper leaves remote, reduced, 3-parted into simpler divisions, often ca. 1 cm. wide; inflorescence of few open subnaked branches with remote bracts ca. 1 cm. long; flowers often more or less crowded at ends of branches, bright blue to paler; pedicels 5–20 mm. long, densely pubescent, the 2 bracteoles at the middle or above, entire, linear or nearly so, 5–10 mm. long; sepals oblong to obovate, 1.3–1.8 cm. long, the upper with an outer brownish spot, crisp-pubescent, the spur 5–8 mm. long, ca. 4 mm. wide at the base, pubescent, more or less decurved, lateral sepals strigose along the middle, lower pair strigose along upper half from base to tip; upper petals cream, more or less lanceolate, 8–14 mm. long, 2-toothed at apex, short-pubescent upward, the spur 3–6 mm. long; lower petals blue, 10–14 mm. long, the limb oval, unequally bifid, bearded, narrowed into a claw 5–6 mm. long; stamens 5–8 mm. long, somewhat pubescent, dilated at the base; follicles 3–5, crisp or spreading pubescent, 12–20 mm. long, 3 mm. wide, the beak 2 mm. long; seeds covered with numerous imbricate scales.

TYPE: Simen, Ethiopia, *Rüppell*.

DISTRIBUTION. Open woodland and grassland, 1400–3000 m., Ethiopia, Karara Hills of eastern Sudan, eastern Belgian Congo, Kenya, Tanganyika, Kirk Range of Mozambique and eastern Nigeria.

REPRESENTATIVE SPECIMENS. Ethiopia: *Schimper* 397, 752; *Scott* 231; *Curle* 140, 380; *Archer* 8657; *F. G. Meyer* 7465; *Schweinfurth & Riva* 1472; *Pappi* 390, 4811; *Mooney* 5820, 6264; *Bally* 7035, 10033; *Massey* 62. Northern Rhodesia: *Burtt* 6114, 6214; *Nash* 274; *Milne-Redhead* 444; *F. White* 2742. Sudan: *Robbie* 6. Kenya: *Mooney* 7528. Belgian Congo: *Dubois* 1049; *Kassner* 2748; *de Witte* 343; *Robyns* 2155. Tanganyika: *Chapman* 321; *Brass* 16990, 17150; *Jackson* 1860. Nigeria: *Migeod* 344; *Lightbody* 26257; *Tamajong* 22210; *Hepper* 2847; *Unwin* 214. Mozambique: *Mendonça & Wild* 994.

Delphinium dasycaulon has a remarkable distribution from Ethiopia to the Congo, Kenya, Mozambique and Nigeria. It is quite distinct from



Figs. 1-6. Petals in *Delphinium* (length given for upper petal includes spur).
 FIG. 1. *D. staphisagria*. Left-hand figure, upper petal (16 mm. long) with spur to left; right-hand drawing, of lower petal, 10 mm. high, from *Alleizetti*, May 1, 1953 (MO). FIG. 2. *D. balansae*. Spurred petal 10.5 mm. long, lower petal 7.5 mm. long, from *Chevallier* 255 (F). FIG. 3. *D. dasycaulon*. Spurred petal 14 mm. long, lower petal 13 mm., from *Pappi* 4811 (MO). FIG. 4. *D. leroyi*. Spurred petal 48 mm. long, from *Greenway* 9711 (NY); lower petal 6 mm. high, from *MacInnes* 206 (MO). FIG. 5. *D. macrocentron*. Spurred petal 38 mm. long, lower petal 14 mm., from *Piemeisel & Kephart* 553 (US). FIG. 6. *D. sylvaticum*. Spurred petal 22 mm. long, lower petal 10 mm., from *St. Lager*, 1909 (NY).

the other similarly distributed species (*D. leroyi* and *D. macrocentron*) in its much smaller flowers, especially in its shorter spurs. It would, therefore, be expected to have quite different pollinators.

In spite of going so far into the tropics, these three species inhabit areas with temperate climates.

4. *Delphinium leroyi* Franch. ex Huth, Bot. Jahrb. 20: 474, pl. 6, fig. 5. 1895. FIG. 4.

D. goetzeanum Engl. Bot. Jahrb. 30: 308. 1902. Type, from the Ruhudge River, at 1900 m., Ubena, March 25, 1899. At Kew in a type cover is *Goetze* 804 from Ubena.

D. wellbyi Hemsl. Kew Bull. 1907: 360. 1907. Based on a type from between Harrar and Addis Ababa, Wellby, 1898 (K!).

D. macrocephalum Engl. Bot. Jahrb. 45: 267. 1910. Based on Jaeger 434 from Wanegehochland, between Olmoti and Ossirwa. Not seen.

D. gommingeri Volkens ex Engl. Bot. Jahrb. 45: 266, 269. 1910. The type, Gomminger from Kilimanjaro, not seen.

D. ruspolianum Engl. Bot. Jahrb. 45: 267. 1910. *Riva* on the Ruspoli Expedition, Dscharibule, Gallahochland. Not seen.

D. candidum Hemsl. Bot. Mag. 133: pl. 8170. 1907. From between Mt. Elgon and Kisumu, Uganda, grown in the garden of Lady Hindsip in 1904 (K!).

Perennial from a woody rhizome, the stem mostly one, erect, with scattered slender hairs below, retrorsely crisp pubescent above, 4–15 (–20) dm. high, slender, branched in the inflorescence; basal and lower leaves with petioles 12–35 cm. long, sparsely pilose; the midcauline petioles shorter, dilated at the base, retrorsely pubescent; upper remote, passing into sessile bracts; blade of lower leaves to ca. 1 dm. wide, more or less reniform-rounded in outline, palmatifid into 5 main cuneate-ovate divisions, these in turn 3-lobed and ending in ultimate broad teeth; main caudine leaves more narrowly parted and sharply toothed; inflorescence paniculate with few-flowered lax racemes; bracts lance-linear, mostly entire, 1–3 cm. long; pedicels suberect, 4–12 cm. long, with 2 bracteoles near middle or in upper half, these largely 5–15 mm. long; flowers fragrant, white, sometimes with a purplish, pinkish or bluish tinge, or deep blue; sepals with a brownish spot outside, oblong to obovate, 2.5–4 cm. long, the lateral subtruncate, the others more or less pointed, all somewhat crisp pubescent without, the spur horizontal, curved upward, 3–4.5 cm. long; upper petals lance-ovate, the blade 2–3 cm. long, 5–9 mm. wide, glabrous, more or less deeply 2-toothed or -lobed at apex, the spur 3–4.5 cm. long; lower petals clawed, the limb lanceolate or lance-ovate, entire to unequally bilobed to 3-lobed, mostly 0.6–1.5 cm. long, 0.5–1 mm. broad; stamens 6–9 mm. long, the filaments dilated below, more or less ciliate, anthers black or dark brown, sparsely pubescent; follicles 3, more or less pubescent, ca. 2–2.5 cm. long, 3–4 mm. thick, the beak 3 mm. long; seeds dark, ca. 1.5 mm. in diameter, covered with numerous small imbricate scales.

TYPE: Kilimanjaro, Leroy (P!).

DISTRIBUTION. At about 1800–3000 m., Ethiopia, southern Sudan, Congo, Tanganyika, Kenya, and eastern Northern Rhodesia.

ILLUSTRATIONS. Bot. Mag. 133: pl. 8170. 1907; Gard. Chron. III. 74: 217. 1923, 88: 193. 1930.

REPRESENTATIVE SPECIMENS. Ethiopia: Hiller & Lithgoe 516; F. G. Meyer 7539; Scott 30; Archer 8619; Mooney 6705, 7012; Gillett 14559, 14936. Sudan: Jackson 405; J. G. Myers 11688; H. B. Johnston 1531; Chipp 70. Kenya: Greenway & Doughty 8532; Rogers 412; Anita Curtis 674, 679, 693; Snowden 501; Chandler 996; Maitland 1263; Tothill 2608. Tanganyika: Schlieben 838, 5084; Greenway 9711; Brass 17172, 17269; Duncan 48117. Northern Rhodesia: F. White 2741.

Dr. W. A. Archer, formerly of the National Arboretum at Washington, D.C., told me some years ago that the natives in the region of Addis Ababa, Ethiopia, collect large quantities of *Delphinium leroyi* for the cut-flower market, partly because of the size of the flowers and partly for their fragrance. As can be seen from the synonymy, the species varies greatly in flower color, but the floral morphology seems quite consistent, as do foliage and habit.

5. *Delphinium macrocentron* Oliver, Jour. Linn. Soc. Bot. 21: 397. 1885.

FIG. 5.

Perennial from a woody rhizome, mostly one-stemmed, the stem erect, coarse, hollow, 6–20 dm. tall, few-branched near summit only, more or less retrorse-pilose throughout, more densely spreading-pubescent above; lower petioles 0.3–3 dm. long, the blades 3–12 cm. broad, 3–5-parted into rather narrow divisions, these in turn laciniate into lance-linear sharply toothed segments; caudine leaves gradually reduced and simpler upward, the uppermost linear and entire to trifid, 3–4 cm. long; inflorescence openly few-branched, the racemes to ca. 10-flowered, rather dense; bracts lance-linear, commonly 1–2 cm. long; pedicels 2–5 cm. long, stout, erect with recurved apex; bracteoles opposite, 5–12 mm. long, in upper part of pedicel; flowers blue and greenish, especially the latter when dry; upper sepal spreading, round-ovate, 12–15 mm. long, densely pubescent without, the spur straight, erect, 2.2–2.6 cm. long, 5–7 mm. wide at base and almost as wide for its entire length; lateral sepals rounded, 10–12 mm. long, pubescent mostly along median part; lower sepals much the same, but more pointed and more generally pubescent; upper petals pale with greenish tinge, the blades 12–16 mm. long, 2-lobed and pubescent at tip, the spurs 2 or more cm. long; lower petals ca. as long, gradually expanded from the broad claw to a shallowly bilobed pubescent tip; stamens ca. as long as sepals, expanded and somewhat ciliate below, the anthers dark; carpels 3, pubescent, erect or recurved when mature, 2–2.8 cm. long, the beak 7–8 mm. long; seeds dark, rounded, ca. 1.5 mm. in diameter, covered with small imbricate scales.

TYPE: Likipia, Kenya, *J. Thomson* (K!).

DISTRIBUTION. Between 1500 and 3500 m., Kenya.

ILLUSTRATIONS. HOOKER, Ic. 16: *pl. 1501*. 1886; Bot. Mag. 133: *pl. 8151*. 1907.

REPRESENTATIVE SPECIMENS. Kenya: *G. Taylor* 1277, 1367, 1309; *Anita Curtis* 870; *Greenway* 7854; *Pole Evans & Erens* 1435; *Greenway & Doughty* 8519, 8521; *C. W. Eliot* 1545; *Bogdan* 547; *Snowden* 486, 817; *Lugard* 26; *Hardy & Bally* 10777.

Delphinium macrocentron Oliver seems amply distinct from its closest relative, *D. leroyi*, as a rather local species of Kenya. The peculiar green shade of the flowers, especially as they dry, the thicker shorter spurs, the

pubescence of the upper petals, the mostly much shorter sepals set it quite apart.

6. *Delphinium sylvaticum* Pomel, Nouv. Mat. Fl. Atl. 382. 1875.

FIG. 6.

Perennial from a base covered with fibrous leaf vestiges, the stem usually solitary, erect, 4–8 dm. tall, more or less flexuous, striate, branched above, retrorse-hairy below, more spreading-hairy above; radical leaves gone by time of anthesis, the petioles to ca. 3 dm. long, pubescent, the blades 10–15 cm. wide, pubescent, roundish in outline, 3–5-palmately-parted into obovate-cuneiform segments which are more or less deeply incised into lanceolate pointed ultimate divisions; caudine leaves scattered, gradually reduced up the stem, the upper tripartite with trifid segments and 3–6 cm. long; inflorescence an open panicle of many-flowered lax racemes to 2 dm. long; bracts simple to trifid with linear lobes and commonly 5–15 mm. long; pedicels densely pubescent, more or less glandular, 1–2.5 cm. long, the green linear bractlets above the middle, 3–6 mm. long; flowers a lively blue, ca. 2 cm. in diameter; upper sepal strigose, ovate-oblong, ca. 10 mm. long, the spur ca. 15 mm. long, mostly straight, horizontal or ascending, strigose; other sepals oblong-ovate, 10–12 mm. long, the upper pair strigose along the middle, the lower on the entire outer surface; upper petals almost as long, glabrous, cream, 2-toothed; lower petals bearded, bifid, ca. 10 mm. long, gradually attenuate to the broad claw; stamens subglabrous, 5–6 mm. long, bluish except for the dilated membranous lower half; follicles 3, oblong, 12–15 mm. long, more or less loosely pubescent; seeds blackish, 2–3 mm. long, oblong, subtrigonous, densely covered with elongate scales.

TYPE: Guerouch, Beni-Foughal, Algeria, *Pomel*. Not seen.

DISTRIBUTION. In fairly well watered places, largely in eastern Algeria and in TUNISIA.

ILLUSTRATION. MAIRE, Fl. de l'Afrique du Nord 11: 71. 1964.

REPRESENTATIVE SPECIMEN. Algeria: D'Azazga a Takouren, Kabylie, *Saint-Lager*, July 18, 1909.

Delphinium sylvaticum Pomel is apparently an endemic of rather local distribution and not well represented in herbaria. Of the perennial African species of the genus it agrees with *D. dasycaulon*, *D. leroyi* and *D. macrocentron* in its rather large leaves and mostly three carpels, but is more northern in distribution.

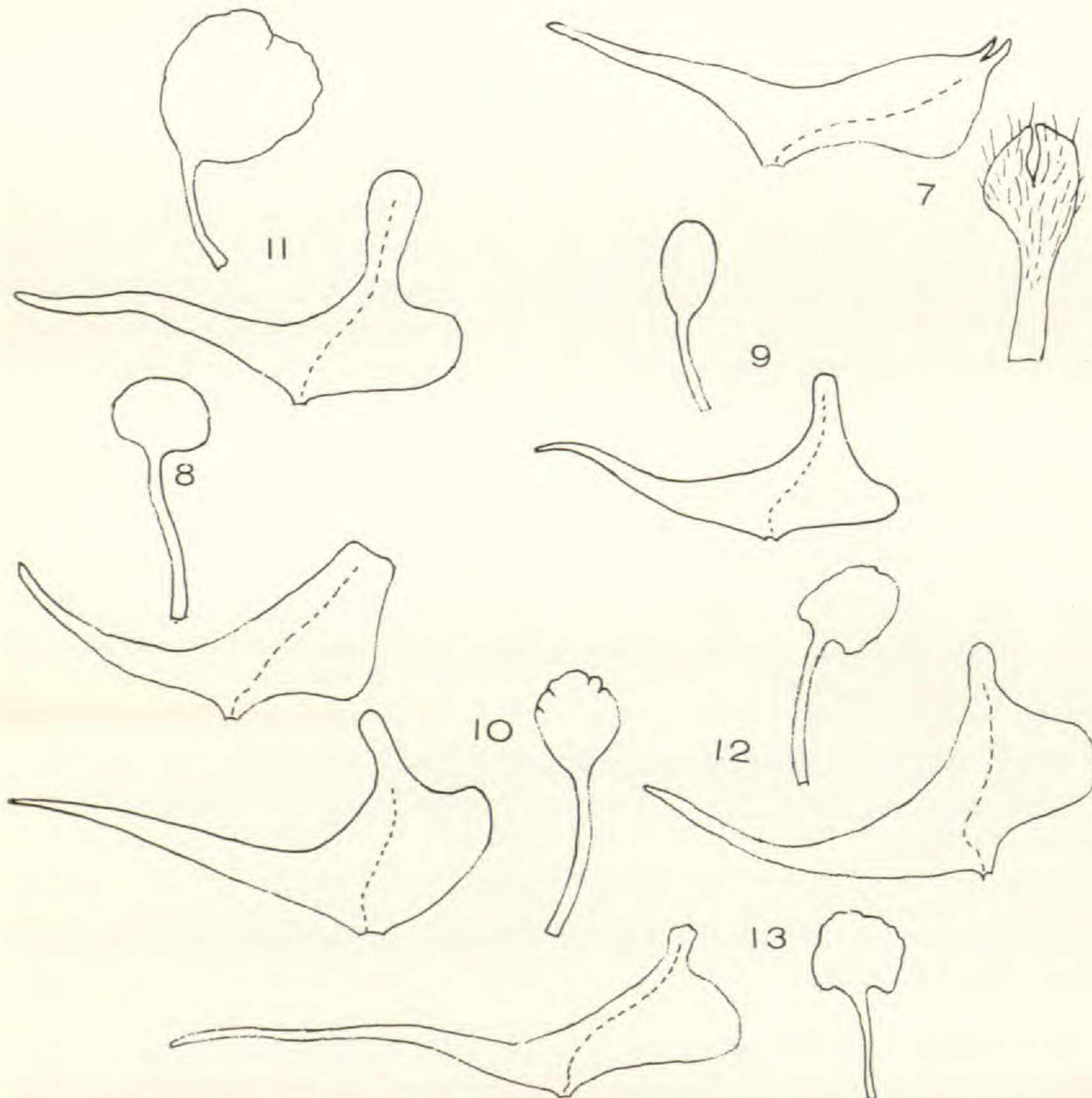
7. *Delphinium pentagynum* Lam. Encycl. 2: 264. 1786.

FIG. 7.

D. pentagynum vars. *homeotrichum*, *glabratum*, *phialotrichum*, and *heterotrichum* Maire, Bull. Soc. Hist. Nat. Afr. Nord 20: 209–210. 1929. A series based on pubescence, whether the hairs are bulbous at base or not, gland-tipped or not, appressed or not.

D. hybridum Willd. subsp. *fissum* (W. & K.) Huth var. *pentagynum* (Lam.) Huth, Bot. Jahrb. 20: 341. 1895.

Perennial from a tuberous root, base of plant covered with fibrous remains of old leaves; stems one to few, 2-7 dm. tall, more or less pubescent below with rather long retrorse hairs, glabrous or pubescent above, mostly somewhat branched in the inflorescence; basal leaves in a rosette, often withered at anthesis, long-petioled, the blades rounded to subreniform in outline, 3-7 cm. broad, subglabrous to pubescent, palmately 3-5-parted



FIGS. 7-13. Petals in *Delphinium* (length given for upper petal includes spur). FIG. 7. *D. pentagynum*. Spurred petal 22 mm., lower petal 12 mm. long, from *Faure*, May 31, 1908 (us). FIG. 8. *D. cossonianum*. Spurred petal 10 mm., lower petal 5.5 mm. long, from *Gattefossé*, June 15, 1936 (MO). FIG. 9. *D. peregrinum*. Spurred petal 13 mm., lower petal 9 mm. long, from *Balansa* 728 (A). FIG. 10. *D. nanum*. Spurred petal 25 mm., lower petal 13 mm. long, from *Letourneux*, 1877 (MO). FIG. 11. *D. obcordatum*. Spurred petal 22 mm., other 13 mm. long, from *Gattefossé*, June 18, 1936 (MO). FIG. 12. *D. gracile*. Spurred petal 22 mm., other 11 mm. long, from *Reverchon* 249 (GH). FIG. 13. *D. halteratum*. Spurred petal 29 mm., other 10 mm. long, from *Faure*, April 8, 1929 (BH).

into cuneiform-obovate segments, these more or less lobed into narrow or rather broad lobes or teeth, acute to mucronate; cauline leaves remote, short-petioled to subsessile, the segments commonly divided into linear lobes; inflorescence open, simple to several-branched, laxly 4–10-flowered on each branch; bracts green, the lowermost sometimes dissected, most are simple, linear, 3–10 mm. long; pedicels pubescent to glabrous, 3–20 mm. long, bibracteolate near the middle or below; flowers pale or dirty violet-blue, 2–2.5 cm. in diameter; upper sepal appressed pubescent without, ovate, 9–12 mm. long, the spur horizontal or ascending, straight or somewhat curved, pubescent, 12–16 mm. long, 3–4 mm. wide at base; lateral and lower sepals more or less oblong, 12–16 mm. long, the upper petals strigose along middle line, the others over the whole outer surface; upper petals glabrous, yellowish usually tinged with blue, 20–22 mm. long including the spur, 2-toothed at tip; lower petals with the limb oval, bearded, blue, bifid, 9–12 mm. long; stamens 7–8 mm. long, glabrous or sometimes ciliate, broadly dilated in lower half; follicles 5 (rarely 3, 4, or 6), usually pubescent, divergent, 12–14 mm. long including styles; seeds obpyramidal, dark, 1.2–1.5 mm. long, with long straight scales.

TYPE: "on trouve cette plante dans le Portugal"; in Lamarck Herbarium, Paris (P-LA).

DISTRIBUTION. In semiarid and wetter regions, below 1500 m., Morocco, Algeria, Iberian Peninsula.

ILLUSTRATIONS. DESFONTAINES, Fl. Atlant. 1: pl. 111. 1798; MAIRE, Fl. de l'Afrique du Nord 11: 68. 1964.

REPRESENTATIVE SPECIMENS. Morocco: *Font Quer* 108, 153; *Faure*, May 17, 1933; *Fairchild* 59. Algeria: *Faure*, May 31, 1908, May 19, 1936; *Allard* 2739; *Durando* 402; *Balansa* 575; *Munby* 35; *Jamin* 4.

Among the small-flowered species along the northern fringe of Africa is the *D. pentagynum* group including that species and *D. nevadense* and *D. emarginatum*. They constitute the Series "Pentagyna" of Pawłowski (Fragm. Fl. & Geobot. 9: 436. 1963), whose key and treatment I am following. They are a western Mediterranean group of southern Europe and northern Africa. They are perennial, rather small-leaved and few-flowered and have from three to five carpels.

8. *Delphinium emarginatum* Presl, Delic. Prag. 6. 1822.

D. emarginatum var. *africanum* Maire, Fl. de l'Afrique du Nord 11: 66. 1964.

No type cited. Maire says he cannot distinguish a noticeable difference from the Sicilian plant.

Near to *D. pentagynum* Lam., the petioles dilated at the base; stem to 8 dm. tall, pubescent throughout or glabrous above; stem-hairs retrorse-appressed, not more than 0.6 mm. long; sepals 10 mm. long, bluish-lilac, glabrous without, not longer than the spur; petals bilobed into attenuate obtusish lobes; filaments glabrous; follicles 3, erect, glabrous.

TYPE: Sicily.

DISTRIBUTION. Occasional in Algeria and northern Tunisia; Sicily.

ILLUSTRATION. MAIRE, Fl. de l'Afrique du Nord 11: 65. 1964.

REPRESENTATIVE SPECIMENS. Algeria: Mustapha near Algiers, *Gandoger* 614; Bone, en Barbarie, Decaisne dedit 1835. Tunisia: Hamman-el-Lif, Mt. Dj. Bou-Kournein, *S. Murbeck* 2.

9. **Delphinium nevadense** Kunze, Flora (Regensb.) 29: 647. 1846.

D. emarginatum Presl var. *nevadense* (Kunze) Maire, Fl. de l'Afrique du Nord 11: 66. 1964.

Near to *D. emarginatum* Presl, the stems glabrous above, distinctly angled, to 12 dm. tall; stem-hairs retrorse, but not appressed, up to 0.9 mm. long; sepals and spur glabrous; sepals 10–13 mm. long, bright blue, yellow-spotted above, distinctly shorter than the spur; petals simply emarginate; filaments more or less ciliate at summit of dilated part; follicles 3, glabrous.

TYPE: "Sierra Nevada, ad fluvium Monachil, inter frutices, prope San Geronimo," Spain, probably *Boissier*. Not seen.

DISTRIBUTION. Southwestern Spain, northwestern Africa.

REPRESENTATIVE SPECIMENS. Tunisia: Djebel Zoghoun, July 2, 1854, *Kralik* 22. Morocco: Montes des Kebdana, June 12, 1934, *Sennen & Mauricio*.

10. **Delphinium cossianum** Batt. Bull. Soc. Hist. Nat. Afr. Nord 8: 215. 1917.

FIG. 8.

D. cossianum var. *laxiflorum* Gattefossé & Maire in Maire, Bull. Soc. Hist. Nat. Afr. Nord 29: 404. 1938.

Annual, more or less finely strigulose, or subglabrous below, 2–7 dm. tall, erect, simple or few branched, the stems angled; basal leaves gone by flowering time; caudine leaves short-petioled to subsessile, usually present at anthesis, closely placed, commonly 1.5–4 cm. long, tripartite into segments 2–3 times divided into linear parts, glabrous, subcoriaceous; racemes densely and usually many flowered, up to 4 dm. long; bracts green, exceeding pedicels, 2–3.5 cm. long, strigulose; pedicels strigulose, ridged, 4–10 mm. long, the 2 bracteoles linear, 7–15 mm. long; flowers deep lively blue; upper sepal ca. 1 cm. long, somewhat strigulose, the spur horizontal or ascending, slightly curved, 10–13 mm. long; lateral sepals oblong, 8–10 mm. long, slightly strigulose along the middle; lower sepals similar, but more generally strigulose; upper petals white at base, violet at apex, retuse or emarginate, ca. 8 mm. wide at summit; lower petals ca. 9 mm. long, the rounded violet limb more or less cordate at base and narrowed abruptly into the claw; stamens shorter than the petals, the filaments whitish, glabrous; carpels 5 (3, or 4), usually glabrous, becoming almost 1 cm. long; seeds dark, ca. 1 mm. in diameter, with rings of scales.

Type not designated. Battandier had three specimens collected by Grant near Fez and Meknès in central Morocco. These I have not seen, except for a specimen from Fez, *Abdul Grant*, com. Aug., 1887 (K).

DISTRIBUTION. Argillaceous soils of rather arid plains and hills, particularly in central and eastern Morocco.

ILLUSTRATION. MAIRE, Fl. de l'Afrique du Nord 11: 74. 1964.

REPRESENTATIVE SPECIMENS. Morocco: Pitard 2925, 2926, 2929; Jahandiez 94; Gattefossé, June 15, 1936; Maire, June 22, 1936; C. G. Garnett, May 7, 1936.

Among the annual species of *Delphinium* in Africa the only one with five carpels is *D. cossonianum*. It is a Moroccan endemic noteworthy because of its rather remarkable dense, many-flowered racemes of deep but lively blue flowers.

11. *Delphinium peregrinum* L. Sp. Pl. 1: 531. 1753.

FIG. 9.

Synonymy to be in a paper on Asian species.

Annual, more or less gray-pubescent on stems with short stiff, often retrorse hairs, 2–7 dm. tall, usually virgately branched from below, the branches stiff, straight or sometimes spreading, ridged; lower leaves 3–5-parted, the parts cut into 3 or more linear-lanceolate lobes, blades 1–3 cm. long, often wider, longer than the petioles, glabrous, coriaceous; basal and middle leaves deciduous by anthesis; upper leaves entire, linear, much reduced, sessile; racemes terminal, often rather dense, many flowered, bracteate, the bracts subulate, 3–6 mm. long; pedicels stiff-pubescent, to almost 1 cm. long; bracteoles 2, to ca. 3 mm. long; flowers violet; upper sepal 7–8 mm. long, pubescent, prolonged into a straight ascending spur 1.5–2 cm. long and 3–5 mm. wide at base; lateral sepals lance-oblong, pubescent without, 5–7 mm. long; lower pair more pointed and with pubescence more median; upper petals bilobed, ca. 7 mm. long, yellowish at base, violet toward apex, the upper lobe linear, erect, the lower broad, rounded; lower petals 8–10 mm. long, the blade longer than wide, gradually narrowed into the slender claw; stamens 5–8 mm. long, with more or less lavender filaments; follicles 3, pubescent to glabrous, 7–8 mm. long, including the style; seeds ca. 1 mm. long, rounded, scaly, the scales united into rows.

TYPE: "Habitat in Italia, Sicilia, Melita"; in Clifford Herbarium (BM).

DISTRIBUTION. Eastern Mediterranean region from Libya, Sicily, Malta and Dalmatia to Egypt, Turkey, Asia Minor and Iran.

ILLUSTRATION. SIBTHORP & SMITH, Fl. Graeca 6: pl. 506. 1827.

REPRESENTATIVE SPECIMENS. Libya: Attag, Fueihat, Cyrenaica, Keith 731; Zuweitini Terraces, Tripolitania, at 2000', B. C. Park 362.

Of the annual species of North Africa with three carpels, two are eastern Mediterranean and have the laminae of the lower petals cuneate at the

base and pass gradually into the claw. Of these, *D. peregrinum* is the better known and ranges from Libya and Sicily into Asia where it is quite polymorphous. I am grateful to Dr. R. K. Brummitt for sending me a mounted dissected flower from a Libyan collection at Kew to verify identification.

12. *Delphinium nanum* DC. *Syst.* 1: 349. 1817.

FIG. 10.

D. peregrinum L. subsp. *nanum* (DC.) Graebner in Asch. & Graebn. *Syn.* 5. 2: 701. 1929.

Annual, widely and stiffly branched from base, to subsimple, the branches simple or nearly so, more or less hirtellous or spreading-pubescent throughout, the hairs sometimes grayish, more or less interwoven, plants mostly 3–15 cm. high; lower leaves obovate in outline, broadly 3-lobed, long-cuneate at base, 4–6 mm. long, the lobes broad, undivided; main caudine leaves largely simple, narrowly oblanceolate, 1–2.5 cm. long, narrowed at base into a broad petiole, gradually reduced up the stem, the upper bractlike, sessile, 2–6 mm. long; racemes short, loose, few-flowered; pedicels 1–5 mm. long, bibracteolate, the bracteoles lance-linear, 3–4 mm. long; flowers bluish-purple to brownish-violet, with yellow base; upper sepal 6–7 mm. long, densely pubescent as is the horizontal or ascending spur which is 3–4 mm. wide at base, 15–20 mm. long; lateral sepals subovate, 6–7 mm. long, with median strip of pubescence; lower sepals oblong-lanceolate, 6–7 mm. long, tomentellous-pubescent; petals pale, the upper broadly bilobed, glabrous, 7–8 mm. long, 8–10 mm. wide; lower to ca. 1 cm. long, the blade roundish-oblong, ca. 4 mm. wide, narrowed to a claw 4 mm. long; stamens 5–8 mm. long, the filaments apparently bluish; carpels 3, sparsely pubescent, to ca. 8 mm. long in fruit and 2 mm. wide, the beak 2–2.5 mm. long; seeds ca. 1 mm. long, almost round, dark brown, with very closely appressed overlapping scales.

TYPE: near Alexandria, Egypt, *Delile*; probable isotype (BM!).

DISTRIBUTION. Lower Egypt from Bengasi to Adjedabia, especially in Maramarica.

ILLUSTRATION. TÄCKHOLM, Students' Fl. Egypt, *pl.* 57. 1956.

REPRESENTATIVE SPECIMENS. Egypt: *Delile*, 1803; *Parquet* 49; *Letourneux*, *Gaillardet* 121; *Ehrenberg*, 1820; *Muschler*, Feb. 1903; *Mrs. Palmer*, 1932.

Delphinium nanum is very close to *D. peregrinum*, but is a much more pubescent dwarfish species of the very arid deserts of Egypt. It has rounder shorter laminae in the lower petals and fewer-flowered racemes.

13. *Delphinium obcordatum* DC. *Syst.* 1: 350. 1817.

FIG. 11.

D. halteratum Sibth. & Sm. var. *obcordatum* (DC.) Huth, *Bot. Jahrb.* 20: 477. 1895.

D. macropetalum DC. *Syst.* 1: 350. 1817.

D. halteratum Sibth. & Sm. var. *macropetalum* (DC.) Ball, Spicil. Fl. Marocc. 310. 1878.
D. peregrinum L. var. *macropetalum* (DC.) Maire, Fl. de l'Afrique du Nord 11: 79. 1964.

Annual or biennial, 1–3(–6) dm. tall, with slender stems and many long, divaricate branches, usually strigulose; racemes 2–10(–15)-flowered, usually lax; pedicels and sepals strigulose; sepals deep blue-violet, 8–10 mm. long, the spur ca. twice as long; upper petals with a lamina 1 cm. long, winged from near the base, the spur ca. 15 mm. long; lower petals with the lamina exserted, roundish, more or less obcordate, not or little shorter than the claw, not cordate at base; follicles 7–11 mm. long, $\frac{1}{3}$ – $\frac{1}{5}$ as wide, slender, densely strigulose, often divaricate.

TYPE: "in Barbaria", North Africa, *P. Durand*. Type not seen.

DISTRIBUTION. Sandy and fallow or rocky places below 1100 m., Morocco, Algeria; Spain.

ILLUSTRATION. DELESSERT, Ic. 1: pl. 57. 1820.

REPRESENTATIVE SPECIMENS. Morocco: *Murdochee*, 1875; *Balansa*, May, 1867; *Hooker*, 1871; *Gattefossé*, June 18, 1936; *Font Quer* 201. Algeria: *Marsilly*, 1847; *Reverchon*, May, 1896; *Faure*, June 17, 1934; *Gandoger*, 1906–7.

In the group of annual species with three carpels there seem to be four species along the Mediterranean coast of north Africa very closely related to *Delphinium halteratum* and by Maire (Fl. de l'Afrique du Nord 11: 76–81. 1964) even included under *D. peregrinum*, but the much more abrupt contraction of the lower petals into the claw seems to me to set them quite apart and I am following Pawłowski (Fragm. Fl. & Geobot. 9: 438–444. 1963) in his concept of this complex. He proposes a new series *Halterata* as contrasted to the series *Peregrina*. As shown in the key at the beginning of the present paper, the distinction between the constituent species is based largely on the shape of the laminae of the lower petals and is quite technical. One certainly feels that *D. halteratum* is more than subspecifically distinct from *D. peregrinum* as in the Maire treatment. Pawłowski has carefully worked out synonymy and characterized the species and I am happy to follow his treatment for *D. obcordatum*, *D. gracile*, *D. verdunense* and *D. halteratum*.

14. *Delphinium gracile* DC. Syst. 1: 347. 1817.

FIG. 12.

D. cardiopetalum DC. var. *gracile* (DC.) Willk. in Willk. & Lange, Prodr. Fl. Hisp. 3: 970. 1880.
D. halteratum Sibth. & Sm. var. *gracile* (DC.) Huth, Bot. Jahrb. 4: 477. 1895.

Stems 2–9 dm. tall, with long slender virgate branches, strigulose to subglabrous; upper leaves mostly entire; racemes usually lax, 2–15(–30)-flowered; sepals often pale lilac-violet to whitish, 7–9 mm. long, strigulose-puberulent; spur mostly 2–2½ times as long as sepals; limb of upper

petals ca. 12 mm. long, the spur ca. 17 mm. long; lower petals with a limb ca. 5 mm. long, exserted, cordate or subcordate at base, somewhat oblong, $1\frac{1}{2}$ –2 times as long as wide, the claw ca. 7 mm. long; follicles 6–11 mm. long, $2\frac{1}{2}$ –4 times as long as wide, glabrous or sparsely strigulose.

TYPE: Andalusia, Spain, *Lagasca*. Not seen.

DISTRIBUTION. Occasional in fallow and waste places below 1200 m., Morocco and Algeria; Spain and Portugal.

REPRESENTATIVE SPECIMENS. Morocco: *Ibrahim*, June 23, 1888; *Font Quer* 200. Algeria: *Reverchon* 249; *Faure*, June 7, 1906; *Garrigues*, 1887; *Le Cesve*, 1923, 1933; *C. G. Abbot*, 1911.

15. *Delphinium verdunense* Balbis, Cat. Stirp. Hort. Bot. Taur. App. 3: 31. 1813.

D. cardiopetalum DC. Syst. 1: 347. 1817.

D. halteratum Sibth. & Sm. var. *cardiopetalum* (DC.) Huth, Bot. Jahrb. 20: 477. 1895.

D. tribracteolatum DC. Syst. 1: 350. 1817.

D. halteratum Sibth. & Sm. var. *tribracteolatum* (DC.) Huth, Bot. Jahrb. 20: 477. 1895.

Much like *D. halteratum*; leaves usually all divided into linear-oblong segments; racemes short and dense, mostly 5- to 15-flowered; sepals deep blue-violet, 8–12 mm. long, strigulose; spur 14–19 mm. long; lower petals with the limb up to $\frac{3}{4}$ as long as the claw, included, strongly cordate at the base; follicles 6–10 mm. long, $2\frac{1}{2}$ –4 $\frac{1}{2}$ times as long as wide, almost glabrous.

TYPE: Verdun, southern France.

DISTRIBUTION. Apparently occasional in fallow fields, clearings, etc., Morocco and Algeria; southwestern Europe.

ILLUSTRATION. PAWLOWSKI, *Fragm. Fl. & Geobot.* 9: 442. 1963.

REPRESENTATIVE SPECIMENS. Morocco: *Gattefossé*, 1933. Algeria: *Garrigues*, 1887.

I am following Pawłowski (*Fragm. Fl. & Geobot.* 9: 441. 1963) in taking up the name *D. verdunense* for what has generally been called *D. cardiopetalum*. His description and excellent illustration have greatly aided me in interpreting the few North African collections I have seen.

16. *Delphinium halteratum* Sibth. & Sm. *Prodr. Fl. Graeca* 1: 371. 1806 and *Fl. Graeca* 6: *pl. 507*. 1826. FIG. 13.

D. peregrinum L. ssp. *halteratum* (Sibth. & Sm.) Batt. *Fl. Alg.* 16. 1888.

D. peregrinum sensu many auth., not L.

D. peregrinum L. var. *confertum* Boiss. *Voy. Espagne* 2: 12. 1839–45.

D. halteratum Sibth. & Sm. var. *confertum* Fenzl ex Huth, *Bot. Jahrb.* 20: 477. 1895.

D. cardiopetalum DC. var. *oranense* Debeaux, Rev. Bot. 8: 264. 1890.

Annual, the stems glabrous or mostly retrorsely strigulose, erect, simple or more usually branched, at least above, 1–8 dm. tall; lower leaves 3–5-parted, the parts cuneate, with lance-linear mucronate divisions; blades commonly 1.5–4 cm. wide and long, glabrous to pubescent, on petioles to the same length; upper caudate leaves shorter petioled to subsessile, commonly 3-parted into lance-linear lobes or simple, acuminate, the upper and middle leaves persisting until anthesis; racemes few to many flowered; bracts subulate, 3–10 mm. long; pedicels strigulose to pubescent, to ca. 1 cm. long, with 2 bracteoles; flowers blue-violet; upper sepal 7–9 mm. high, mostly strigulose without, the spur ascending, strigulose, ca. 3–4 mm. wide at base, 15 mm. long; lateral sepals lance-oblanceolate, ca. 7 mm. long, with a median strigulose band; lower sepals more pointed and more generally strigulose; upper petals ca. 1 cm. long, greenish yellow at base, violet in upper half, bilobed, the upper lobe narrow, erect, the lower rounded; lower petals scarcely exserted, the lamina orbicular, truncate or rounded and weakly cordate at base, ca. 3–4.5 mm. in diameter, rather abruptly narrowed into a longer claw; stamens 5–7 mm. long, with somewhat lavender filaments; carpels 3, usually strigose, rarely glabrous, 7–10 mm. long in fruit; seeds subglobose, the scales coalesced in ca. 3 horizontal rows.

TYPE: "In Sicilia, et, ni fallor, in monte Athô, legit Sibthorp" (OXF).

DISTRIBUTION. Sandy and disturbed places, in the western Mediterranean of southern Europe and northern Africa, especially about Oran, Algeria.

ILLUSTRATIONS. SIBTHORP & SMITH, Fl. Graeca 6: pl. 507. 1826; PAWLOWSKI, Fragm. Fl. & Geobot. 9: 440, 441. 1963.

REPRESENTATIVE SPECIMENS. Morocco: *Font Quer* 200, 201, 202; *Ibrahim*, June 19, 1898; *Mauricio* 7759, 9215; *Pitard* 2927, 2928; *Jahandiez* 632. Algeria: *Balansa* 650, 651; *Le Cesve* 4363; *Munby* 22; *Reverchon* 249; *Faure*, 1934; *Duffour* 2317.

2. *Consolida* (DC.) S. F. Gray

Consolida, as a genus, S. F. Gray, Nat. Arr. Brit. Pl. 2: 711. 1821. As a section, DC. Syst. 1: 341. 1817. As a subgenus, Huth, Bot. Jahrb. 20: 337. 1895; Dalla Torre & Harms, Genera Siphonogamarum 165. 1901.

Plants annual. Leaves laciniate. Inflorescence racemose or paniculate, the flowers zygomorphic. Sepals 5, petaloid, the posterior one spurred. "Petal" one, apparently representing the fused superior petals of *Delphinium*, sometimes called "nectary" or "honey-leaf"; subentire to 3–5-lobed, bearing a single nectariferous spur extending into the sepal spur. Stamens in 5 spirally arranged series. Carpel 1, forming a follicle.

Type species, *C. regalis* S. F. Gray (*Delphinium Consolida* L.).

A highly specialized genus ranging from the western Mediterranean to central Asia, but with several species widely cultivated and escaping from gardens in many parts of the world.

KEY TO AFRICAN SPECIES OF CONSOLIDA

- a. Follicle 6–15 mm. long, more or less compressed; plants mostly branched from the base and with widespread open habit.
 - b. Spur 10–22 mm. long, exceeding the blade of the upper sepal in length.
 - c. Sepals 7–8 mm. long, lilac; middle lobe of "petal" scarcely evident, much exceeded by the forward-projecting lateral lobes. Morocco, Algeria. 1. *C. mauritanica*.
 - c. Sepals mostly 10–16 mm. long; middle lobe of "petal" evident, not exceeded by the lateral lobes.
 - d. Middle lobe of "petal" not divided at apex. Algeria, Tunisia. 2. *C. pubescens*.
 - d. Middle lobe of "petal" with two small terminal lobes at least 1 mm. long. Occasional garden escape. 3. *C. regalis*.
 - b. Spur 5–7 mm. long, ca. equal to blade of upper sepal. Egypt. 4. *C. deserti*.
- a. Follicle 15–25 mm. long, subterete; main stem forming an axis into the inflorescence; side branches few.
 - e. Bracteoles usually below the middle of the pedicel; sepals 12–14 mm. long; spur ca. 15 mm. long. Garden escape. 5. *C. ambigua*.
 - e. Bracteoles near the summit of the pedicel; sepals 10–12 mm. long; spur ca. 10 mm. long. Morocco, Algeria. 6. *C. orientalis*.

1. **Consolida mauritanica** (Coss.) Munz, comb. nov.

FIG. 14.

Delphinium mauritanicum Cosson, Bull. Soc. Bot. Fr. 27: 68. 1880.

D. Loscosii Costa var. *brevirostratum* Pau, Bull. Soc. Iber. Ciencias Nat. 22: 91. 1923.

Annual, more or less densely cinereous-pubescent with spreading and retrorsely appressed hairs (many in the upper part stiff and with bulbous base), usually 1-stemmed, 2–5 dm. tall, branched from base and/or above, the branches stiff, more or less divaricate; lower leaves not or scarcely rosulate, mostly withered at anthesis, with petioles 2–3 cm. long, largely tripartite, then again divided into numerous linear lobes, the blades commonly 1–2.5 cm. in diameter; cauline leaves rather crowded on main stem, gradually reduced upward and shorter-petioled, the uppermost sessile, a few mm. long, remote; upper branches with few remote flowers; bracts mostly with few linear lobes and 2–5 mm. long; pedicels 3–10(–20) mm. long, the bractlets near the middle, linear, entire, 2–4 mm. long; flowers lilac, 12–15 mm. in diameter; sepals lance-oblong, obtuse, pubescent without, 7–8 mm. long, each with a greenish median pubescent band; spur slightly curved, horizontal or ascending, ca. 15 mm. long; the "petal" whitish with colored border, almost as long as the sepals, 12–14 mm. wide, with 2

rounded lobes at the outer corners and 2 short median teeth; stamens somewhat shorter than the "petal", ciliolate on the dilated lower part; anthers ca. 0.8 mm. long; follicle oblong, more or less compressed laterally, 10–12 mm. long, strigose, muricate-tuberled near ventral suture; seeds ca. 2 mm. long, obpyramidal, subtetragonal, blackish, covered with horizontal rows of overlapping scales.

TYPE: Lalla-Maghnia, Oran, Algeria, May 24, 1856, Bourgeau (p!; isotype, κ).

DISTRIBUTION. Clearing in woodland, rocky places, etc. below 1500 m., Morocco, Algeria.

ILLUSTRATIONS. COSSON, Ill. Fl. Atlant. 1: pl. 3. 1882; MAIRE, Fl. de l'Afrique du Nord 11: 60. 1964.

REPRESENTATIVE SPECIMENS. Morocco: Benoist, July 2, 1918; Font Quer 202 bis; Sennen & Mauricio 7754; Jahandiez 333, 802b. Algeria: Faure, June 30, 1933, July 11, 1923; Lefranc 501; Warion 2, 670; Battandier, May, 1922.

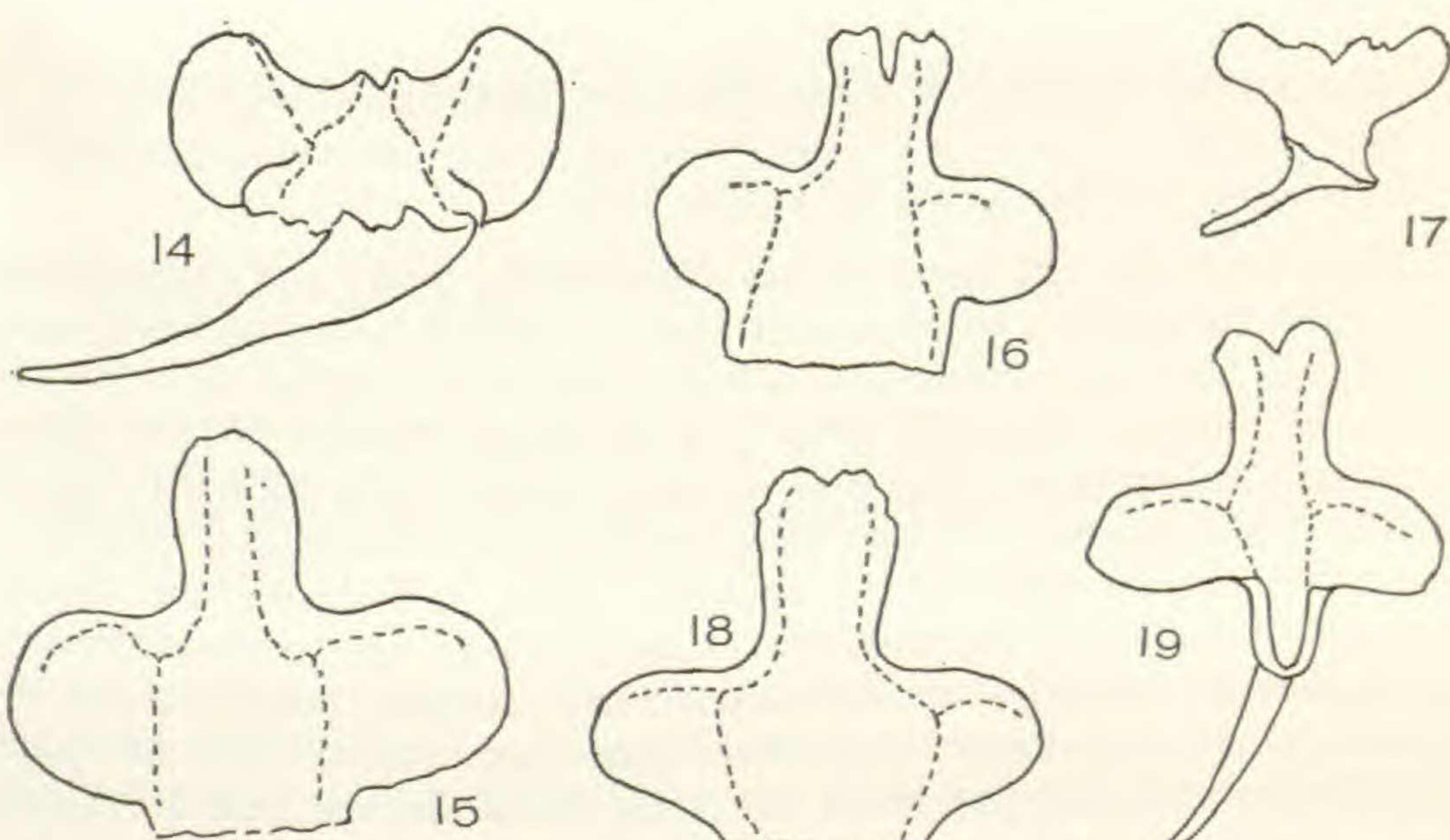
2. *Consolida pubescens* (DC.) Soó, Österr. Bot. Zeitschr. 71: 241. 1922.

FIG. 15.

Delphinium pubescens DC. Fl. France 6: 641. 1815.

D. pubescens DC. var. *dissitiflorum* Cosson, Compend. 2: 46. 1887.

Retrorse-strigulose, with some upper hairs bulbous at the base, mostly 1-stemmed, 1–5 dm. tall, more or less branched, especially above, rather



Figs. 14–19. "Petal" in species of *Consolida* (some shown with spur, some without). FIG. 14. *C. mauritanica*. Blade 13 mm. wide, from *Faure*, June 30, 1933 (GH). FIG. 15. *C. pubescens*. Blade 18 mm. wide, from *Toulouse*, June 19, 1841 (US). FIG. 16. *C. regalis*. Blade 15 mm. wide, from *Taccan*, 1926 (NY). FIG. 17. *C. deserti*. Blade 8 mm. wide, from *Uvarov*, 1932 (BM). FIG. 18. *C. ambigua*. Blade 17 mm. wide, from *Levine* 824 (GH). FIG. 19. *C. orientalis*. Blade 13 mm. wide.

leafy in lower half; lower leaves in a basal rosette, petioled, gradually reduced upward and becoming sessile, all multifid into more or less mucronate linear lobes, the blades pubescent, commonly 2–3 cm. in diameter; flowers few to several at end of main stem and branches, lilac, pale blue or rose or whitish, 1–2 cm. in diameter; bracts mostly simple, sometimes palmatifid, commonly 1–2 cm. long; pedicels 1–3 cm. long; bracteoles entire, linear, 3–5 mm. long, opposite or alternate; sepals ovate to ovate-oblong, obtuse, strigose, short-unguiculate, commonly 10–15 mm. long, each with a greenish spot toward the tip; spur straight or nearly so, horizontal, 18–20 mm. long, more or less strigose; "petal" 15–18 mm. wide, glabrous, with 2 large rounded lateral lobes and a median emarginate to slightly divided lobe 3–4 mm. long; stamens 4–6 mm. long, the filaments dilated $\frac{2}{3}$ their length and ciliolate; anthers yellow, 1 mm. long; follicle strigose, 10–15 mm. long, the style glabrous; seeds obpyramidal, dark, 1.5–2 mm. long, covered with transverse rows of scales.

TYPE: "in agris et segetibus regionis Gallo-Mediterraneae."

DISTRIBUTION. Stony steppes and open places, high plateaus and Saharan Atlas; Algeria, Tunisia; southern Europe.

ILLUSTRATIONS. COSTE, Fl. France 1: 50. 1901; MAIRE, Fl. de l'Afrique du Nord 11: 57. 1964.

REPRESENTATIVE SPECIMENS. Algeria: Chevallier 535b; Kralik 23; Lefranc 501. Tunisia: Letourneux, April 29, 1884; Pitard 651; Murbeck, May 25, 1896. Libya: K. M. Guichard, March 4, 1955.

3. *Consolida regalis* S. F. Gray, Nat. Arr. Brit. Pl. 2: 711. 1821.

FIG. 16.

Delphinium consolida L. Sp. Pl. 1: 530. 1753.

Plant 2–12 dm. tall, more or less divaricately, freely and rather finely branched, subglabrous to retrorse-strigulose; radical leaves petioled, early deciduous, the main cauline leaves trifid, then again partite into ultimate linear mucronate, strigulose lobes 1–5 cm. long; flowers few, in rather open terminal racemes, deep blue, or more seldom, pink to white; bracts mostly simple, linear, 3–15 mm. long; pedicels very slender, 1–5 cm. long; bracteoles linear, alternate to opposite, often well below the flower, 1.5–4 mm. long; sepals 9–16 mm. long, more or less ovate, narrowed at both ends, scarcely- or short-unguiculate, strigose, mostly along the midrib in the lateral pair; spur 17–22 mm. long; "petal" blue to cream, 12–15 mm. wide, the spur 16–17 mm. long, middle lobe of limb 3.5–5 mm. high, shortly 2-lobed at apex, each of these lobules often emarginate; lateral lobes rounded, 4–5 mm. long; stamens 4–7 mm. long, the filaments dilated on lower portion, anthers 0.6–0.7 mm. long, yellow; follicle to 2 cm. long, including the 2–3 mm. style; seeds dark, with transverse rows of subcontiguous scales.

TYPE: "Habitat in agris Europae restilibus."

DISTRIBUTION. Europe, Caucasia, Turkey. Occasional escape from gardens in northern Africa.

ILLUSTRATION. REICHENBACH, Ic. Fl. Germ. 4: pl. 66. 1840; HEGI, Fl. Mittel.-Eur. 3: 487. pl. 114. 1909; MARIE, Fl. de l'Afrique du Nord 11: 62. 1964.

4. *Consolida deserti* (Boiss.) Munz, comb. nov.

FIG. 17.

Delphinium deserti Boiss. Fl. Orient. 1: 83. 1867.

Plant 5–30 cm. tall, diffusely branched from below, short viscid-hairy; leaves 5–25 mm. long, short-hairy, palmately parted into oblong-linear segments, these again laciniate in the main leaves, the tips sharp; bracts 5–8 mm. long, oblong-linear; pedicels 1.5–3 cm. long; bracteoles near middle of pedicel, 3–5 mm. long; flowers small, yellow; sepals hairy, oblong, 4–6 mm. long; spur straight, 5–6 mm. long; "petal" obovate, ca. 6 mm. wide, 4-lobed, the outer lobes longer, semi-ovate, the middle ones smaller, a row of brownish red spots across the base of the lobes; spur horizontal, equalling the blade of the "petal", ca. 5–6 mm. long; filaments sparsely hairy; anthers yellow, rounded, 0.5 mm. long; follicle oblong, viscid-hairy, 6–10 mm. long, 2–2.5 mm. wide, the beak slender, ca. 2 mm. long; seeds oblong, with densely imbricate scales about the cupuliform center.

ISOTYPES: Bové 131 from desert between Suez and Gaza, July 1832 (K!; P!).

DISTRIBUTION. Egypt and Asia Minor, in desert conditions.

REPRESENTATIVE SPECIMEN. Egypt: "Luksor", R. Muschler, March 1904.

5. *Consolida ambigua* (L.) Ball & Heywood, Repert. Sp. Nov. 66: 151. 1962.

FIG. 18.

Delphinium ambiguum L. Sp. Pl. ed. 2. 749. 1763.

D. ajacis sensu auth., not L. Sp. Pl. 1: 531. 1753.

Consolida ajacis sensu auth., not (L.) Schur, Verh. Siebenburg. Ver. Naturf. 4: 47. 1853.

Subglabrous, especially below, to more or less pubescent, especially above, with short fine appressed or spreading hairs, mostly 1-stemmed, 3–10 dm. tall and with ascending-horizontal branches above; lower leaves long petioled, the blades 2–5 cm. in diameter, multifid into ultimate mucronate linear segments largely 1–1.5 mm. wide; caudine leaves gradually reduced upward, the upper sessile, often 1–2 cm. long; bracts entire to multifid, the lower often at least as long as the pedicels, the uppermost 2–3 mm. long; inflorescence rather lax, each branch ending in a few- to many-flowered raceme; pedicels commonly 1–3 cm. long; bractlets mostly 1.5–4 mm. long, usually below the middle of the pedicel; flowers blue to rose to white, 2–2.5 cm. across; sepals ovate, attenuate at base, obtuse

at apex, more or less pubescent, each with a greenish subapical spot, ca. 12–14 mm. long; spur ca. 15 mm. long, straight or slightly curved; "petal" 3-lobed, the central lobe oblong, ca. 6 mm. long, with 2 short rounded lobules, the 2 lateral lobes rounded, ca. as long, the spur 15–16 mm. long; stamens 6–7 mm. long, the filaments abruptly dilated at base, glabrous, anthers yellow; follicle pubescent, cylindric, 16–22 mm. long, the style ca. 2 mm. long; seeds black, ca. 2.5 mm. long, oblong-trigonous, with undulating transverse rows of scales.

TYPE: Mauritania, northwest Africa, the type (LINN) a double garden form.

DISTRIBUTION. Mediterranean region, but African material seems to be garden escapes.

ILLUSTRATIONS. REICHENBACH, Ic. Fl. Germ. 4: pl. 67. 1840; MAIRE, Fl. de l'Afrique du Nord 11: 54. 1964.

6. *Consolida orientalis* (Gay) Schröd. Abhandl. Zool.-Bot. Ges. Wien 4(5): 25. 1909. FIG. 19.

Delphinium orientale Gay in Desm. Cat. Dordogne 12. 1840, nomen; Boiss. Fl. Orient. 1: 79. 1867.

D. hispanicum Willk. Prodr. Fl. Hisp. 3: 969. 1880. Type not cited.

D. orientale Gay ssp. *hispanicum* (Willk.) Batt. in Batt. & Trab. Fl. Alg. 15. 1888.

D. orientale var. *hispanicum* (Willk.) Huth, Bot. Jahrb. 20: 376. 1895.

D. ajacis L. var. *orientale* (Gay) Finet & Gagnep. Bull. Soc. Bot. Fr. 51: 467. 1904.

Mostly 1-stemmed, simple or branched, especially above, erect, 2–6 dm. tall, the lower parts retrorse-strigose, upper with more or less crisped pubescence, some hairs gland-tipped, some swollen at base; leaves mostly subglabrous, the lower petioled and early withered, the principal leaves multifid, crowded on stems, the blades 2–4 cm. long, the segments linear or lance-linear, 1–2.5 mm. wide, more or less ciliolate; uppermost leaves sessile; flowers few to many, in racemes that are rather dense in anthesis, more open in fruit; bracts green, the lower with linear parts, the upper entire, linear, 5–20 mm. long; pedicels 0.5–4 cm. long, bibracteolate near the summit; flowers 1.5–2.5 cm. in diameter, dark purple or violet to rose or white, sepals round-ovate to oval or somewhat narrower, 10–12 mm. long, abruptly contracted into a pubescent basal claw, almost as long as the blade which is rounded to obtuse at the summit, more or less pubescent; spur ca. 1 cm. long; "petal" usually of same color as sepals, 3-lobed, 8–10 mm. long, the median lobe ovate to oblong-ovate, 2-lobed, somewhat longer than the rounded lateral lobes; stamens ca. 6–7 mm. long, the filaments dilated at the base, with some gland-tipped hairs at upper end; anthers yellow, ca. 1.5 mm. long; follicle strigose, 14–22 mm. long, oblong-cylindric, with some hairs gland-tipped, the style 1.5–2 mm. long; seeds brownish black, obpyramidal, angular, 1.5–2 mm. long, with several undulating transverse rows of short scales.

TYPE: described from cultivated material from the Orient, isotype (K!).

DISTRIBUTION. Grain fields and disturbed places, Morocco and Algeria; Spain, Hungary to Asia.

ILLUSTRATIONS. Bot. Mag. 169: (n.s.) pl. 186. 1952; DAVIS, Fl. Turkey 1: 129, fig. 2. 1965.

REPRESENTATIVE SPECIMENS. Algeria: Dukerley 3805; Balansa 1009; Maire 4887; Reboud 203; Choulette 203 bis; E. G. Paris 402.

A number of color forms has been proposed by Maire, Fl. de l'Afrique du Nord 11: 55-56. 1964.

SYNONYMY OF AFRICAN SPECIES OF CONSOLIDA AND DELPHINIUM

CONSOLIDA — genus #2

- C. ajacis* = *C. ambigua*
- C. ambigua* = species #5
- C. deserti* = species #4
- C. mauritanica* = species #1
- C. orientalis* = species #6
- C. pubescens* = species #2
- C. regalis* = species #3

DELPHINIUM — genus #1

- D. ajacis* = *Consolida ambigua*
- D. ajacis* var. *orientale* =
 Consolida orientalis
- D. ambiguum* = *Consolida ambigua*
- D. balansae* = species #2
- D. balansae* *formae caeruleum*
 & *pallidum* = *D. balansae*
- D. candidum* = *D. leroyi*
- D. cardiopterum* = *D. verdunense*
- D. cardiopterum* var.
 gracile = *D. gracile*
- D. cardiopterum* var.
 oranense = *D. halteratum*
- D. consolida* = *Consolida regalis*
- D. cossonianum* = species #10
- D. cossonianum* *forma laxi-*
 florum = *D. cossonianum*
- D. dasycaulon* = species #3
- D. dasycaulon* var. *minor* =
 D. dasycaulon
- D. deserti* = *Consolida deserti*
- D. emarginatum* = species #8
- D. emarginatum* var. *africanum*
 = *D. emarginatum*

- D. emarginatum* var.
 nevadense = *D. nevadense*
- D. goetzeanum* = *D. leroyi*
- D. gommingeri* = *D. leroyi*
- D. gracile* = species #14
- D. halteratum* = species #16
- D. halteratum* var. *cardio-*
 petalum = *D. verdunense*
- D. halteratum* var. *confertum* =
 D. halteratum
- D. halteratum* var. *gracile* =
 D. gracile
- D. halteratum* var. *macroptera-*
 lum = *D. obcordatum*
- D. halteratum* var. *obcordatum*
 = *D. obcordatum*
- D. halteratum* var. *tribracteola-*
 tum = *D. verdunense*
- D. hispanicum* = *Consolida orientalis*
- D. hybridum* ssp. *fissum* var.
 pentagynum = *D. pentagynum*
- D. leroyi* = species #4
- D. loscosii* var. *brevirostratum* =
 Consolida mauritanica
- D. macrocentron* = species #5
- D. macrocephalum* = *D. leroyi*
- D. macropterum* = *D.*
 obcordatum
- D. mauritanicum* = *Consolida mauritanica*
- D. nanum* = species #12
- D. nevadense* = species #9
- D. obcordatum* = species #13

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D. orientale ssp. and var.
hispanicum = *Consolida orientalis*
D. pentagynum = species #7
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heterotrichum, *homeotrichum*, *phialotrichum* = *D. pentagynum*
D. peregrinum = species #11
D. peregrinum var. *confertum* =
D. halteratum
D. peregrinum ssp. *halteratum* = *D. halteratum*
D. peregrinum var. *macropetalum* = *D. obcordatum*
D. peregrinum ssp. *nanum* =
D. nanum
D. pubescens = *Consolida pubescens*
D. pubescens var. *dissitiflorum* = *Consolida pubescens*
D. ruspolianum = *D. leroyi*
D. staphisagria = species #1
D. sylvaticum = species #6
D. tribulatum = *D. verdunense*
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